

Promoting ecological solutions for sustainable infrastructure

Anders Sjölund¹, Yannick Autret², Marita Boettcher³, Julie de Bouville⁴,
Lazaros E. Georgiadis⁵, Elke Hahn⁶, Agnès Hallosserie⁴, Adam Hofland⁷,
Jean-François Lesigne⁸, Antonio Mira⁹, Charlotte Navarro⁴, Carme Rosell¹⁰,
Tony Sangwine¹¹, Andreas Seiler¹², Paul Wagner¹³

1 Swedish National Transport Administration Trafikverket, Cederströmsgatan 1, 212 39 Malmö, Sweden
2 Ministry for the Ecological and Solidarity Transition, 246 Bd Saint-Germain, 75007 Paris, France **3** Federal Agency for Nature Conservation (Bfn), Konstantinstraße 110, 53179 Bonn, Germany **4** Fondation pour la recherche sur la biodiversité, 195 Rue Saint-Jacques, 75005 Paris, France **5** Environmental Consultant, Florina, Greece **6** Austrian Federal Ministry of Transport, Bundesministerium für Verkehr, Innovation und Technologie, Radetzkystraße 2, 1030 Wien, Austria **7** Rijkswaterstaat, Boompjes 200, 3011 XD Rotterdam, The Netherlands **8** Réseau de Transport d'Électricité, La Défense, 7 C Place du Dôme, immeuble Window, Puteaux, France **9** University of Évora, Largo dos Colegiais 2, 7004-516 Évora, Portugal **10** Minuartia, C/ d'Aragó, 208, 5º 3ª, 08011 Barcelona, Spain **11** Retired from Highways England, Quinton Business Park 3, Ridgeway, Quinton, Birmingham B32 1AF, United-Kingdom **12** Swedish University of Agricultural Sciences, Almas Allé 8, 750 07 Uppsala, Sweden **13** Federal Agency for Nature Conservation Washington State Department of Transportation, 310 Maple Park Ave SE, Olympia, WA 98504, USA

Corresponding author: Charlotte Navarro (iene.secretariat@gmail.com)

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Linear infrastructure networks such as roads, railways, navigation and irrigation canals, and power lines have grown exponentially since the mid-20th century. Most of these networks built before the 1990s have a significant impact on the environment. While there is no doubt that humanity needs infrastructure to ensure safe, secure and sufficient access to food, water and energy, it is essential to prevent the loss of biodiversity

and ecosystems which are also at the basis of the provision of such fundamental services. Those complex, interconnected issues cannot be tackled without research and innovation, both in the fields of biodiversity and of infrastructure.

IENE (Infrastructure Ecology Network Europe) was set up in 1996 to meet this need. Its mission is to promote the exchange of knowledge, experience and best practice in safe and sustainable pan-European transport infrastructure. With a status of an association today, this independent network has more than 400 members consisting of researchers, engineers, decision makers and infrastructure operators. IENE functions as an international and interdisciplinary forum. It supports cross-border cooperation in research, mitigation, planning, design, construction and maintenance in the field of biodiversity and transport infrastructure.

Every two years, IENE organises an international conference to present cutting-edge research, identify pressing issues and problems, discuss effective solutions and map out future activities in the field of transport ecology and infrastructure. In this special issue we are very glad to present you with some of the best scientific outcomes of the IENE 2020 conference, hoping that it will contribute to further breakthroughs in science and uptake in policy-making and practices on the ground. We commend the organising team of the University of Évora, Portugal, for their excellent programming of the conference and for having gathered exceptional scientists on the topic of biodiversity and infrastructure. They managed to host a high-quality event, despite the many adjustments that had to be done because of Covid-19, including postponing the conference to January 2021 and holding it entirely online.

The topic of IENE conference 2020 was “Linear Infrastructure Networks with Ecological Solutions” and the motto was “working together”. This means that every stakeholder has a role to play, and that biodiversity should be considered at all governance scales and during all phases of the set-up of infrastructure. The papers selected here are of particular interest to follow the path set forth in the conference’s final declaration, which is included in this issue.

To keep the exchange of knowledge going between conferences, these discussions feed into the Wildlife and Traffic handbook that IENE has been curating since 2003. This handbook highlights solutions and measures aimed at mitigating the fragmentation of habitats and animal mortality due to transport infrastructures. It compiles the knowledge accumulated over the past decades on ecological mitigation, as well as best practices identified through a literature review and expert contributions. Its objective is to promote solutions to reconcile biodiversity and transport infrastructure that are evidence-based, action-oriented, feasible, cost-effective and innovative. The handbook aims to be up to date with the latest findings in research and best practise, but will still rest on solid and generally accepted conclusions and experiences.

The handbook will also be further expanded through the European BISON project, in which IENE is a technical leader. This project, the first of its kind supported by the European Union, is funding a €3 million Coordination and Support Action (CSA) on transport and biodiversity. In particular, the project aims to identify future research and innovation needs, sustainable and resilient construction, maintenance and inspec-

tion methods and materials that can be used by different transport modes to mitigate pressure on biodiversity. It builds on more than a decade of IENE conferences and will publish a Strategic Research and Deployment Agenda on the topic of biodiversity and infrastructure in 2023.

The knowledge gathered by IENE is also intended to help the private and semi-public sector. By launching the Transport4nature initiative at the IUCN Congress in September 2021, IENE is inviting transport companies operating at the European level to make commitments to biodiversity. This initiative is accompanied by the work of the IENE Scientific and Expert Committee, and builds on the wide knowledge accumulated in the community for several decades.

At a time when many States are investing massively in infrastructure to stimulate the economy and job creation, the knowledge provided by the IENE network is more than ever essential to put in place sustainable solutions and prevent infrastructure from causing natural and climatic damage that could last for decades and lead to points of no return. We hope that the reading of this special issue will be inspiring, for researchers, practitioners and decision-makers to continue their efforts to reconcile biodiversity protection and infrastructure planning and to implement efficient solutions on the ground.



IENE 2020 International Conference Declaration

Sustainable infrastructure needs ecological solutions – it's time to work together!

We, the participants of the IENE 2020 International Conference, acknowledge that:

1. We are facing a significant worldwide expansion of transportation networks; this is especially the case in countries with developing economies.
2. If no action is taken, this global expansion will entail a substantial increase in greenhouse gas emissions, wildlife mortality and landscape fragmentation and change, with devastating effects on climate, biodiversity and ecosystem services.
3. Globally, ecosystem services are estimated to yield more than the Gross World Product of 2019 (<https://www.worldometers.info/gdp/>).
4. Despite the development and implementation of environmental impact assessment legislation, many existing transportation infrastructure networks are not

environmentally friendly. These impacts are far-reaching with a debt being paid daily through unnecessary risks extendable to human health and well-being.

5. The economic, social, and ecological consequences of biodiversity loss and the role of transportation infrastructure is increasingly acknowledged worldwide:

- Conservation and restoration of ecological connectivity is a major flagship in the preparation of the upcoming United Nations “Post-2020 Global biodiversity framework” following the recognised failure of the Aichi Targets associated with the loss and fragmentation of natural habitats (Target 5) (<https://www.cbd.int/gbo5>).
- The European Green Deal and the new European Biodiversity Strategy for 2030, adopted by the European Commission in May 2020, stresses the need to develop a resilient Trans-European Nature Network supported by ecological corridors allowing the free flow of genes and individuals (https://ec.europa.eu/info/sites/info/files/communication-annex-eu-biodiversity-strategy-2030_en.pdf).
- The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) states that since 1970, transportation infrastructure is an important driver of land use change and associated loss of terrestrial biodiversity (<https://ipbes.net/global-assessment>).
- The World Economic Forum 2020 recognised that biodiversity loss is one of the major threats with ‘plausible higher than average impact’ on Global Economies (<https://www.weforum.org/reports/the-global-risks-report-2020>).

6. To achieve sustainability, infrastructure development must be decoupled from its negative effect on biodiversity. This requires immediate, stringent action and shared responsibilities from all stakeholders.

7. Regional, national, and worldwide networks of experts, including researchers, practitioners, landscape designers, and managers, address such concerns through knowledge-sharing platforms that promote effective ecological solutions.

8. The scarcity of collective and coordinated efforts, such as joint decision-making processes involving environmental, transportation, energy, policy and financing agencies, is still a major obstacle to achieve sustainability in transportation infrastructure projects.

Therefore, we, the participants of the IENE 2020 International Conference, call for an individual and collective endeavour to:

1. Improve robust, science-driven methodologies and decision-support tools to aid sustainable transportation infrastructure planning, based on the no-net loss recommendations, considering cumulative anthropogenic impacts.

2. Mainstream biodiversity and ecological connectivity across all phases of infrastructure planning, development, construction, and maintenance.

3. Enhance collaboration among all relevant actors in transportation infrastructure development through the creation of a multilevel and multidisciplinary group including representatives from the sectors of transportation (e.g. DG Move, TEN-T), energy (e.g. DG Energy) and environment (e.g. DG Environment, TEN-G), as well as from all other relevant stakeholders.

4. Acknowledge that further development of new infrastructure needs to consider cumulative impacts within a larger landscape context; this requires integration with existing infrastructure to guarantee overall habitat integrity and connectivity, thus accounting for potential synergistic interactions between biodiversity impacts and ecological solutions.

5. Accelerate the ecological adaptation of rapid, transparent, and fair transference of scientific evidence-based knowledge to practitioners, managers and infrastructure designers, to avoid negative impacts of transportation infrastructure development on biodiversity.

6. Assure that investments in new transportation infrastructure projects are conditioned to an assessment of their sustainability, considering the no-net loss recommendations to meet biodiversity conservation targets.

7. Guarantee new transportation infrastructure projects, allocate further funding for research and innovation, monitoring and evaluation, as well as knowledge-sharing.

8. Strengthen platforms that support cooperation among scientists, practitioners, and agencies, encouraging international studies that promote direct, rapid exchange of knowledge in a “learning together” environment as opposed to a “learning from each other” process.

9. Establish the foundation for an International “Observatory for the Ecological Effects of Transportation Infrastructure and related mitigation works and policies”, to compile standardized information from which new insights can be gained and new remedies can be developed.

These proposed actions are the responsibility of all of us, but the support and incentive of decision-makers is the main foundation upon which the provision, implementation and dissemination of the actions can take place, safeguarding a sustainable earth where biodiversity and people may thrive together.

What are IENE Declarations?

Since 1996, IENE operates as an international and interdisciplinary forum to encourage and enable cross-boundary cooperation in research and mitigation and planning in the field of ecology and transport infrastructures. The IENE biannual international conference provides interdisciplinary discussion panels for these activities with the aim to present cutting-edge research, identify urgent questions and problems, discuss effective solutions, and outline the paths for upcoming activities in transport and infrastructure ecology. Since 2012, a Declaration has been produced during each conference and focused on a topic that requires particular attention from transportation and nature conservancy stakeholders. This message represents a common statement by the participants and addresses decision makers, planners, technicians and researchers as well as the general public, by calling for actions that contribute to finding solutions to old and emerging conflicts, filling the research gap and, overall, minimising the impact that transport infrastructure exerts on nature.